SC

[A-59]

No. of printed pages:02

SARDAR PATEL UNIVERSITY

B.Sc. (SEM-VI) Examination(Regular & NC)

Friday, 9th April, 2016

USO6CMTHO6: (Mechanics-II)

Time: 2:30 p.m. to 5:30 p.m. **Maximum Marks : 70**

Note: Figures to the right indicate marks to the questions.

Q.1 Answer the following by selecting the correct choice from the given options. [10]

(1) Unit of linear momentum in cgs system is_____.
(a) cm sec^{-1} (b) MLT^{-2} (c) dyne sec (d) MLT^{-1}

(2) In the absence of _____ T+V=E does not hold.
(a) kinetic energy (b) potential energy (c) (a) or (b) (d) conserve field.

(3) When the system is conservative _____.
(a) $\dot{W} = -\dot{V}$ (b) $\dot{W} = \dot{V}$ (c) W = -V (d) W = V

(4) On trajectory, at an instance _____, the velocity is horizontal
(a) $\frac{u_x}{g}$ (b) $\frac{u_y}{g}$ (c) $\frac{u_x}{\sqrt{g}}$ (d) $\frac{u_y}{\sqrt{g}}$

(5) Maximum height attained by a projectile is at time_____.
(a) $\frac{u^2 sin^2\alpha}{2g}$ (b) $\frac{u\,sin\alpha}{g}$ (c)) $\frac{u^2 sin2\alpha}{g}$ (d) $\frac{2u\,sin\alpha}{g}$

(6) At an angle $\alpha = \frac{\pi}{4}$, $\frac{d^2R}{d\alpha^2}$ is _____.
(a) maximum (b) minimum (c) positive (d) negative .

(7) The moment of inertia of a uniform rod of length 2a ,about a line passes through one end and perpendicular to the rod is _____.
(a) $\frac{4ma^2}{3}$ (b) $\frac{4m^2 a}{3}$ (c) $\frac{4m^2a^2}{3}$ (d) $\frac{4ma}{3}$

(8) The orbit described by a particle moving under central attractive force is _____.
(a) centroid (b) circle (c) parabolic (d) elliptic.

(9) Two bodies are said to be perfectly inelastic if e =_____
(a) 1 (b) -1 (c) 0 (d) none

(10) v_a =_____. v_s
(a) e (b) $\frac{1}{e}$ (c) e^2 (d) $\frac{1}{e^2}$

Q.2 Answer ANY TEN of the following: **[20]**

(1) Define: central force.
(2) State the principle of angular momentum about the mass centre.
(3) Define: Angular momentum.
(4) Prove that $gT^2 = 2R \cdot tan\alpha$
(5) Give the factors effecting resistance of a projectile.
(6) Prove that $y = x \cdot tan\alpha(1 - \frac{x}{R})$
(7) Define: moment of inertia of a system of particles.
(8) State theorem of $K\ddot{O}NIG$.
(9) Find the law of force towards the pole for the curve described by $r = ae^{-n\theta}$
(10) State equation of motion of a simple pendulum.
(11) Define: Line of impact.
(12) Define: Compound pendulum.

Q.3

(a) State and prove principle of angular momentum about a point. [5]

(b) **Verify the principle of conservation of energy if a particle of mass m falling down vertically under the force of gravity.** [5]

OR

Q.3

(a) State and prove principle of conservation of energy. [5]

(b) **Verify the principle of conservation of energy if a particle of mass m slides down on a smooth Inclined plane starting from the rest.** [5]

Q.4

(a) Show that the path of projectile is a parabola. [5]

(b) A gun mounted on a hill of height h above level plane. Show that if the resistance of air is neglected, then the greatest horizontal range for given muzzle velocity v is obtained by firing at an angle of elevation θ such that $cosec^2\theta = 2(1 + \frac{gh}{v^2})$ [5]

OR

Q.4

(a) In usual notation prove that , $\frac{1}{v}\frac{dv}{d\theta} = \frac{\emptyset(v)+sin\theta}{cos\theta}$ and hence prove that $\frac{1}{v}\frac{dv}{d\varphi} = tanh\varphi + \emptyset(v)$ [5]

(b) If R is the horizontal range and H is the greatest height of a projectile then prove that initial velocity of a projectile is given by $\sqrt{2g(H + \frac{R^2}{16H})}$ [5]

Q.5 Find the moment of inertia of a solid sphere about its diameter. [10]

OR

Q.5 Obtain Cartesian equation of a motion of a particle moving under central attractive force. [10]

Q.6

(a) Find velocities of two smooth spheres after a direct impact between them. [5]

(b) A sphere of mass 1 kg moving with 3 m/sec overtakes another sphere of mass 5 kg moving in the same direction with 60 cm/sec. Show that the direction of motion of first sphere is reserved when e = 0.75 . Also find the loss of K.E. [5]

OR

Q.6

(a) Obtain equation of motion of compound pendulum. [5]

(b) In usual notations find the ratio of v_s to v_a. [5]

X=X=X